

**REMARKS/ARGUMENTS**

Upon entry of this amendment, claim 2 will be canceled without prejudice or disclaimer of the subject matter recited therein, and claims 1, 3, 7, 9, 12-14, 17-19 and 22 will be amended, whereby claims 1, 3, 5, 7, 9, 12-15, 17-19, 22, 24 and 25 will be pending. Claims 1, 7, 12, 13, 14 and 17 are independent claims.

Applicants note that the amendments to the claims are supported by Applicants' originally filed application and therefore do not constitute new matter. For example, the Examiner's attention is directed to Applicants' originally filed specification at page 5, lines 10-12, page 9, lines 4-5 and lines 17-18 and claim 2 with respect to the recitation in claim 1 pertaining to the bioactive glass having a composition substantially comprising 30 to 60 mol % of CaO, 40 to 70 mol % of SiO<sub>2</sub>, 20 mol % or less of Na<sub>2</sub>O, and 0.1-1.0 mol % of CaF<sub>2</sub>; page 19, line 16 to page 20, line 17, Tables 5 and 6 on page 20, including Example 9 with respect to the recitation in claims 1, 7 and 12 pertaining to the sintered calcium phosphate being excellent in cell attachment, cell proliferation and alkaline phosphatase activity; and page 5, lines 10-12, page 8, lines 21-24 and page 9, lines 9-10 with respect to the recitation of claim 14 pertaining to the bioactive glass having a composition consisting essentially of 30 to 60 mol % of CaO, 40 to 70 mol % of SiO<sub>2</sub>, 0.1-5 mol % of Na<sub>2</sub>O, and 5 mol % or less of B<sub>2</sub>O<sub>3</sub>. With respect to newly-added claims 26-28, the Examiner's attention is directed to the previously pending claims, and page 3, lines 26-27, page 5, lines 25-28, and page 8, lines 12-18.

Moreover, the claims have been amended to even further clarify that the bioactive glass is formed from a composition comprising the recited components and the sintered calcium phosphate is formed from a calcium phosphate comprising a hydroxyapatite, a carbonated apatite or tricalcium phosphate.

Reconsideration and allowance of the application are respectfully requested.

### **Response To Anticipation, Obviousness and Double Patenting Rejections**

**(a) Rejection of claims 12, 14, 15, 18 and 25 under 35 U.S.C. 102(b) as being anticipated by, or in the alternative, under 35 U.S.C. 103(a) as obvious over Pfeil et al. (hereinafter "Pfeil"), U.S. Patent No. 4,135,935**

In contrast to the subject matter recited in Applicants' claims, Pfeil discloses, in his Example, a ground glass of the following composition, in weight percent: 46.2 % of  $\text{SiO}_2$ , 25.5% of  $\text{Ca}_3(\text{PO}_4)_2$ , 20.2% of  $\text{CaO}$ , 2.9% of  $\text{MgO}$ , 4.8% of  $\text{Na}_2\text{O}$ , and 0.4% of  $\text{K}_2\text{O}$  (see column 7, lines 55-65), which corresponds to a composition, in mol %: 56.3 % of  $\text{SiO}_2$ , 6.0% of  $\text{Ca}_3(\text{PO}_4)_2$ , 26.4% of  $\text{CaO}$ , 5.39% of  $\text{MgO}$ , 5.7% of  $\text{Na}_2\text{O}$ , and 0.4% of  $\text{K}_2\text{O}$ . Accordingly, Example 1 of Pfeil does not teach or suggest Applicants' bioactive glass which includes, amongst other features substantially 30 to 60 mol % of  $\text{CaO}$ .

Moreover, as is clear from claim 1 of Pfeil, Pfeil discloses a glass of the following composition as a second sintering material B, in weight %: about 20% to about 60% of  $\text{SiO}_2$ , about 5% to about 40% of  $\text{P}_2\text{O}_5$ , about 2.7% to about 20% of  $\text{Na}_2\text{O}$ , about 0.4% to about 20% of  $\text{K}_2\text{O}$ , about 2.9% to about 30% of  $\text{MgO}$ , and about 5% to about 40% of  $\text{CaO}$ .

Preferred amounts of components of Pfeil are disclosed, at column 3, beginning at line 39 to include, in weight %: about 30% to about 60% of  $\text{SiO}_2$ , about 5% to about 20% of  $\text{P}_2\text{O}_5$ , about 3% to about 10% of  $\text{Na}_2\text{O}$ , about 3% to about 10% of  $\text{K}_2\text{O}$ , about 5% to about 20% of  $\text{MgO}$ , and about 10% to about 30% of  $\text{CaO}$ .

Applicants' independent claim 12 is directed to a sintered calcium phosphate comprising a bioactive glass as a sintering aid, said bioactive glass formed from a composition consisting essentially of 30 to 60 mol % of  $\text{CaO}$ , 40 to 70 mol % of  $\text{SiO}_2$ , and 0.1-5 mol % of  $\text{Na}_2\text{O}$ , said sintered calcium phosphate being excellent in cell attachment, cell proliferation and alkaline phosphatase activity, wherein said sintered calcium phosphate is formed from a calcium phosphate comprising a hydroxyapatite, a carbonated apatite or tricalcium phosphate.

The rejection asserts that, "...there is also  $\text{CaO}$  in the  $\text{Ca}_3(\text{PO}_4)_2$  which was excluded from the calculation of the amount of  $\text{CaO}$ ." The rejection contends that glass components go into solution therefore this amount of  $\text{CaO}$  should be included in the glass and would equal greater than 30 mol %  $\text{CaO}$ . Also, the rejection contends that a reference may be used for all it realistically teaches and is not limited to the specific examples, and that the ranges taught by Pfeil clearly encompass the claimed invention.

In response, the claims have been amended to even more clearly recite that the bioactive glass is formed from the recited components. Moreover, the rejection does not provide any support in Pfeil for the assertion that  $\text{CaO}$  in  $\text{Ca}_3(\text{PO}_4)_2$  can be calculated as part of the  $\text{CaO}$  content of Pfeil. Accordingly, if this assertion is maintained in the

rejection, the Examiner is respectfully requested to point out supporting disclosure in Pfeil.

Additionally, as previously pointed out by Applicants, the sintered calcium phosphate comprising a bioactive glass as a sintering aid makes it possible to deposit  $\beta$ -wollastonite crystals having a needle-like structure at a crystallization temperature so as to provide a sintered calcium phosphate excellent in biocompatibility and mechanical strength (such as discussed in Applicants' specification at page 5, line 24 to page 6, line 4; page 20, lines 14-17; and page 21, lines 4-7). Applicants disclosed and claimed sintered calcium phosphate comprising a bioactive glass as a sintering aid is particularly suitable for cell attachment, cell proliferation and alkaline phosphatase activity in the cell culture as described in Example 9 of Applicants' specification (see Applicants' specification at page 19, line 16 to page 20, line 17; and Tables 5 and 6 at page 20).

Applicants respectfully submit that there is no teaching in Pfeil of Applicants' claimed sintered calcium phosphate comprising a bioactive glass as a sintering aid which has the recited advantages. In this regard, the Examiner is reminded that in order to constitute anticipation, a single reference must disclose each and every feature recited in Applicants' claims with sufficient specificity. Compositions as recited in Applicants' claims are not disclosed in Pfeil whereby the anticipation rejection is without appropriate basis and should be withdrawn.

Regarding the obviousness rejection, Applicants submit that there is no suggestion or motivation in Pfeil to modify the compositions disclosed therein to arrive at

Applicants' sintered calcium phosphate comprising a bioactive glass as a sintering aid. This is especially the situation when Applicants' claimed subject matter has advantages which are not taught or suggested in the prior art. In this regard, the rejection is silent with respect to modification of Pfeil, and any suggestion to modify Pfeil to arrive at Applicants' claimed subject matter.

Therefore, the rejection of independent claim 12 and dependent claims 15, 18 and 25 should be withdrawn.

Applicants' arguments regarding the patentability Independent claim 14 are similar to those with respect to independent claim 12. Moreover, claim 14 includes, amongst other features a bioactive glass formed from a composition consisting essentially of 30 to 60 mol % of CaO, 40 to 70 mol % of SiO<sub>2</sub>, 0.1-5 mol % of Na<sub>2</sub>O, and B<sub>2</sub>O<sub>3</sub>, said B<sub>2</sub>O<sub>3</sub> being present in an amount of 5 mol % or less. In contrast, Pfeil does not teach a bioactive glass including B<sub>2</sub>O<sub>3</sub>. Accordingly, Pfeil does not teach each and every feature of independent claim 14.

The rejection asserts that B<sub>2</sub>O<sub>3</sub> is optional. However, claim 14, prior to the present amendment and after the present amendment, explicitly recites B<sub>2</sub>O<sub>3</sub> as a positive recitation, and is therefore present in Applicants' composition. Accordingly, the rejection of claim 14 is without appropriate basis, and the rejection should be withdrawn.

**(b) Rejection of claims 1-3, 5, 7, 9, 22 and 24 are rejected under 35 U.S.C. 103(a) as obvious over Fujiu et al. (hereinafter "Fujii"), U.S. Patent No. 4,708,652**

Applicants once again note that Fujiu discloses an apatite composite ceramic obtained by reaction-sintering at a sintering temperature of 700-1100°C at a pressure of at least atmospheric pressure a powder mixture of a synthetic hydroxyapatite (A) and a biological active glass (B) containing fluoride ions and having a crystallization temperature below the sintering temperature in a weight ratio of A/B ranging from 60/40 to 30/70. The reaction sintered material of Fujiu is disclosed to have excellent biological affinity and high mechanical strength. Fujiu also discloses that the biological active glass (B) is selected from the scope of the following composition (disclosed in U.S. Patent No. 4,437,192): 35-60 mol % of SiO<sub>2</sub>, 0-15 mole % of B<sub>2</sub>O<sub>3</sub>, 10-30 mol % of Na<sub>2</sub>O, 5-40 mol % of CaO, 0-1 mol % of TiO<sub>2</sub>, 0-15 mol % of P<sub>2</sub>O<sub>5</sub>, 0-20 mol% of K<sub>2</sub>O, 0-10 mol% of Li<sub>2</sub>O, 0-5 mol % of MgO, 0-8 mol % of (Al<sub>2</sub>O<sub>3</sub> + ZrO<sub>2</sub> ± Nb<sub>2</sub>O<sub>5</sub>), 0-8 mol % of (La<sub>2</sub>O<sub>3</sub> + Ta<sub>2</sub>O<sub>5</sub> + Y<sub>2</sub>O<sub>3</sub>) and 5-20 mol % of F<sub>2</sub> (see Abstract, claims 1 and 4, and column 3, lines 35 et seq. of Fujiu).

Reviewing the specific Example of Fujiu at column 5, beginning at line 57, the biologically active glass powder is disclosed as including 46.1 mol % of SiO<sub>2</sub>, 24.4 mol % of Na<sub>2</sub>O, 13.5 mol % of CaO, 13.4 mol % of CaF<sub>2</sub> and 2.6 mol % P<sub>2</sub>O<sub>5</sub>. Moreover, in the Comparative Examples, Fujiu discloses a biologically active glass not containing fluoride ions including 46.1 mol % of SiO<sub>2</sub>, 24.4 mol % of Na<sub>2</sub>O, 26.9 mol % of CaO and 2.6 mol % P<sub>2</sub>O<sub>5</sub>.

Also, in the Examples of U.S. Patent No. 4,437,192, the mol % of CaO is apparently disclosed as a highest value of 15 mol %. Moreover, for examples of Na<sub>2</sub>O in U.S. Patent No. 4,437,192, many examples include Na<sub>2</sub>O above 20 mol %. For examples, 10 and 12, Na<sub>2</sub>O is below 20 mol %; however, the mol % of CaO is lower in these examples.

In the previous response, Applicants noted that a copy of U.S. Patent No. 4,437,192 was being submitted to assist the Examiner's review of this patent and was being listed on the attached Form PTO-1449. However, a copy does not appear to have been submitted and was not listed on the Form PTO-1449. Accordingly, so that the record is complete, Applicants are submitting a copy herewith, and listing the document on the attached Form PTO-1449.

In contrast to the disclosure of Fujiu, Applicants' independent claim 1 is directed to a sintered calcium phosphate comprising a bioactive glass as a sintering aid, said bioactive glass formed from a composition substantially comprising 30 to 60 mol % of CaO, 40 to 70 mol % of SiO<sub>2</sub>, 20 mol % or less of Na<sub>2</sub>O, and 0.1-1.0 mol % of CaF<sub>2</sub>, said sintered calcium phosphate being excellent in cell attachment, cell proliferation and alkaline phosphatase activity, wherein said composition forming the bioactive glass is free from P<sub>2</sub>O<sub>5</sub>, and said sintered calcium phosphate is formed from a calcium phosphate comprising a hydroxyapatite, a carbonated apatite or tricalcium phosphate. Moreover, Applicants' independent claim 7 is directed to a sintered calcium phosphate comprising a bioactive glass as a sintering aid, said bioactive glass formed from a composition

substantially comprising 30 to 60 mol % of CaO, 40 to 70 mol % of SiO<sub>2</sub>, and at least one of Na<sub>2</sub>O, CaF<sub>2</sub> and B<sub>2</sub>O<sub>3</sub>, Na<sub>2</sub>O being 20 mol % or less, CaF<sub>2</sub> being 0.1-1 mol %, and B<sub>2</sub>O<sub>3</sub> being 5 mol % or less, said sintered calcium phosphate being excellent in cell attachment, cell proliferation and alkaline phosphatase activity, wherein said sintered calcium phosphate is formed from a calcium phosphate comprising a hydroxyapatite, a carbonated apatite or tricalcium phosphate.

Fujiu is silent with respect to a bioactive glass being a sintering aid in a sintered calcium phosphate. Moreover, Fujiu does not discuss a bioactive glass having cell attachment, cell proliferation and alkaline phosphatase activity as described in Example 9 of the present application.

Still further, Fujiu discloses broad ranges of components, but does not provide any motivation to arrive at compositions recited in Applicants' claims. There is absolutely no motivation in Fujiu to pick and choose from the various ranges disclosed therein (and further disclosed in U.S. Patent No. 4,437,192) to arrive at Applicants' claimed subject matter. This is especially apparent from a review of the specific examples of Fujiu, such as disclosed in U.S. Patent No. 4,437,192 referenced at column 3, lines 35-53 of Fujiu.

Still further, Applicants note that the bioactive glass of Applicants' independent claims, and claims dependent thereon, include such features that when the bioactive glass as a sintering aid makes it possible to deposit  $\beta$ -wollastonite crystals having a needle-like structure at a crystallization temperature so as to provide a sintered calcium phosphate glass excellent in biocompatibility and mechanical strength (see page 5, lines



24-28; and page 20, lines 14-17 of Applicants' specification), particularly suitable for the cell attachment, cell proliferation and alkaline phosphatase activity in the cell culture as described in Example 9 of Applicants' application (see page 19, line 16 to page 20, line 14; and Tables 5 and 6 at page 20 of the Applicants' specification).

In response to the Examiner's comments in the rejection, Applicants note that claims 1 and 7 recite cell attachment, proliferation and alkaline phosphatase activity, and include  $\text{Na}_2\text{O}$  and  $\text{CaF}_2$ .

Moreover, the dependent claims further patentably define the subject matter recited in Applicants' independent claims. Accordingly, these claims are patentable over Fujiu for the features recited in the independent claims as well as the further features recited in the dependent claims.

Those having ordinary skill in the art referring to Fujiu would not have been motivated to arrive at Applicants' claimed subject matter. Accordingly, this ground of rejection should be withdrawn.

**(c) Rejection of claims 1-3, 5, 7, 9, 12-15, 17-19, 22, 24 and 25 under the judicially created doctrine of obviousness-type double patenting over claims 1-11 of copending Application No. 10/962,557**

In response to this ground of rejection, Applicants note that Application No. 10/962,557 is pending, and has been allowed with a Notice of Allowance being mailed on July 10, 2006 and the issue fee paid September 28, 2006.

Applicants respectfully request the Examiner to reconsider the double patenting rejection based upon the merits in view of the presently pending claims and the allowed claims in Application No. 10/962,557. In this regard, if the rejection is maintained, the Examiner is respectfully requested to contact the undersigned by telephone to discuss the same with a view towards advancing the application to allowance. In this regard, Applicants are presently preparing an executed Terminal Disclaimer for filing.

### CONCLUSION

In view of the foregoing, the Examiner is respectfully requested to reconsider and withdraw the rejections of record, and allow each of the pending claims.

Applicants therefore respectfully request that an early indication of allowance of the application be indicated by the mailing of the Notices of Allowance and Allowability.

Should the Examiner have any questions regarding this application, the Examiner is invited to contact the undersigned at the below-listed telephone number.

Respectfully submitted,  
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